Rhizoctonia Root Rot in Snap Bean Following Corn with Conservation Tillage

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In the Georgia Coastal Plain, fall snap bean is planted frequently following field crops, including corn. *Rhizoctonia solani* anastomosis group (AG) type 2 causes crown and brace root rot in corn, and *R. solani* AG-4 may colonize mature corn stalks and roots. Both fungi are indigenous in the soils of the Georgia coastal plain and may cause severe root and hypocotyl root in snap bean. Deep-turning soil with a moldboard plow will bury propagules of *R. solani*, but conservation tillage practices are encouraged in order to reduce soil erosion. This investigation was undertaken to study the ecology and control of *R. solani* root rot of snap bean in a double-crop system with corn using conservation tillage on Tifton loamy sand (fine, loamy, siliceous, thermic Plinthic Paleudults, 85, 10, and 5% sand, silt, and clay, respectively, pH 5.8 to 6.3, 0.5% organic matter).

For three successive years (1984-1986), Greencrop snap bean was planted notill following field corn with either moderate to severe crown and brace root rot in infested soil, or no crown and brace root rot in noninfested soil. In 1986, snap bean was planted in two experiments following sweet corn in soil that was infested or noninfested with *R. solani* AG-4 and disk-harrowed. Soil was infested with *R. solani* AG-2 type 2 by spreading 3% cornmeal-sand inoculum (144 to 1430 kg/ha) by hand and incorporating it 5-8 cm deep with a rotary tiller before planting corn in March. Control plots were rototilled but noninfested. After corn was harvested in July, foliage, stalks, and remaining ears were chopped with a rotary mower to 15 cm above the ground. The herbicide glyphosate was used to control weeds and volunteer corn. Fertilizer (NH_4NO_3, 168 kg/ha) was applied over the corn debris and the field irrigated with 1.25 cm of water. In experiments with *R. solani* AG-4, the cornmeal-sand inoculum and fertilizer were spread by hand on the sweet corn debris in July, incorporated with a disk-harrow, and irrigated. In all tests, snap bean was planted in late July through early September and harvested as green pods for fresh market in later September through early November.

In 1984, in snap bean following field corn, yield of green pods was 1056 kg/ha in soil infested with *R. solani* AG-2 type 2 compared with 3185 kg/ha in noninfested soil. Post-emergence damping-off was 15% in infested soil and 6% in noninfested soil. The pathogen was isolated from lesions on only 6% of seedlings grown in noninfested soil, but was isolated from 51% of the seedlings grown in soil infested with *R. solani* AG-2 type 2. Lesions on hypocotyls of plants grown in infested soil were frequently tan to reddish brown and extended 2-7 cm up the hypocotyl. The hypocotyls were water-soaked to shrunken, but the lesions were not reddish-brown, sunken cankers that are symptoms typically observed in soils infested with *R. solani* AG-4.

In 1985 and 1986, *R. solani* AG-2 type 2 was rarely isolated from lesions from plants grown in either infested or noninfested soil, and root diseases in snap bean appeared to be caused primarily by *Pythium* spp., *Macrophomina phaseolina*, *Fusarium solani*, and *R. solani* AG-4 rather than *R. solani* AG-2 type 2. Plants were stunted and stands were uneven in all plots in 1985, and

no yield was taken. In 1986 there were no differences in yield (average of 696 kg/ha) among treatments on soil infested or noninfested with R. solani AG-2 type 2.

In soil infested with R. solani AG-4, snap bean seedlings had typical sunken, reddish-brown cankers on the hypocotyls. In one experiment in 1986, Bush Blue Lake yielded 1251 kg/ha in soil infested with cornmeal sand inoculum (448 kg/ha) of R. solani AG-4 compared with 1852 kg/ha in noninfested soil, and plant stands were reduced 30% in infested soil compared with noninfested soil. In a second experiment, whole plots infested with two inoculum levels of R. solani AG-4, low (224 kg/ha) and high (448 kg/ha) were compared with noninfested soil. Subplots were the breeding lines R-924 (provided by M. H. Dickson) and XPB-189 (provided by Asgrow Seed Company) and the cultivars Nemasnap, Atlantic, Greencrop and Eagle. Average subplot yields were 1333, 1421, and 1683 kg/ha in plots infested with high, low, or zero inoculum levels, respectively.

These experiments indicates that notill snap bean immediately following corn diseased with crown and brace root rot may have moderate to severe root and hypocotyl rot with substantial yield loss from R. solani AG--2 type 2. Also, the use of the conservation tillage practice of disk-harrowing to leave some corn debris on the soil surface could result in yield loss to R. solani AG-4. Yield levels in all conservation tillage experiments following corn were lower than in other experiments in spring or fall snap bean following clean tillage with a moldboard plow.